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AUTHOR Gibson, Dudley; Wickham, Derek
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ABSTRACT

Successful strategies for implementing and operating the Further Education Management Information System (FEMIS) at colleges of further education in the United Kingdom are discussed, along with the development of associated microcomputer-based decision support systems. FEMIS has been targeted at the smaller institutions that do not generally have management information systems. A major aim of FEMIS has been to monitor the performance of institutions to demonstrate to funding agencies that they are cost effective. The relationship of the instigator of the development of the system to other key managers is a significant factor in the success or failure of the venture. Types of instigators are identified (e.g., local education agency management, college administrator, computer center staff), and typical scenarios involving each type of instigator are included. Procedures instituted at the Dorset Institute of Higher Education (DIHE) to promote usage of data by college managers are also described. It took about 4 years to fully integrate the FEMIS database within DIHE's infrastructure. (SW)

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Derek Wickham

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Ann K. Dickey, Chair
Forum Publications Editorial
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SUCCESS CRITERIA FOR MIS IMPLEMENTATION AND THE USE OF DSS AS A MANAGEMENT AID IN SMALL COLLEGES IN THE UNITED KINGDOM

THE AUTHORS

DUDLEY GIBSON

Deputy Director (Planning & Resources), Dorset Institute of Higher Education, Wallisdown Road, Poole, Dorset BH12 5BB, United Kingdom (Tel: Poole (0202) 524111 ext 5067).

Formally Head of Information Technology Studies, Business School, City of London Polytechnic; Sir Winston Churchill Fellow (1980); Reader in Management Information Systems, North East London Polytechnic (1974-1978).

DEREK WICKHAM

Senior Research Fellow, Further Education Staff College (FESC), Coombe Lodge, Blagdon, Avon, BS18 6RG, United Kingdom (Tel Blagdon (0761) 62976).

Joined FESC in 1981 after 12 years teaching computer science in various colleges.

THE INSTITUTIONS

Dorset Institute of Higher Education

The Dorset Institute of Higher Education (DIHE) is a polytechnic type institution situated on two major sites three miles apart on the south coast of England. It has 2500 Full-time Equivalent (FTE) students entering at 18+, with around 2000 full-time and 3000 part-time. The DIHE offers a wide variety of courses ranging in level from sub-degree to post-graduate and in areas ranging from computer aided engineering through information technology to business studies, catering and hotel administration to nursing, tourism and communication and media production. It has a relatively high research and consultancy profile generating around $750,000 of income from national research bodies and from the private sector.

The budget of $15,000,000 is derived in the main from monies generated nationally for higher education and transmitted from the National Advisory Body (NAB) for Higher Education through the Local Education Authority (LEA) to the Institute.

DIHE has been involved in the development and testing of the Further Education Management Information System (FEMIS) from the inception of project funding from the Department of Education and Science (DES). The Institute's major function has been to develop success criteria at the implementation

stage and to explore the use of decision support systems as management tools.

The Further Education Staff College

The Further Education Staff College (FESC) is a national centre set up in 1955 with the aim of improving the quality of management in Further and Higher Education. It is funded jointly by all the Local Authorities in the UK. In addition to its mainstream activities of running short courses for college managers, it has been involved in a growing number of centrally funded research projects.

One of these has been the development of computer software to assist in the management of colleges. This is known as the Further Education Management Information System (FEMIS) and has been under development for the last five years. A small team is now permanently associated with the maintenance and development of FEMIS. The FEMIS software development has been subsidised by Central Government grants and runs on a variety of microcomputers. It is currently in use in 216 colleges in the UK.

Abstract

The Further Education Management Information System (FEMIS) has been developed for use in Colleges of Further Education in the UK. This development was funded by the Department of Education and Science with the aim of providing a microcomputer based system to assist with performance monitoring in small colleges.

This paper describes the work done to investigate success strategies for the effective operation and implementation of FEMIS in these institutions and the development of associated microcomputer based decision support systems.

Background

FEMIS has been targeted at the smaller institutions which, in the UK, do not in general have any information systems designed to assist management decision making. These colleges are being forced to re-evaluate their functions and in particular to demonstrate that they are efficient and provide cost effective instruction satisfying local needs.

One of the main aims of FEMIS has been to monitor the performance of such institutions so that they can demonstrate to their funding agencies (both local and national) that they are cost effective. One of the primary indicators of performance is seen as the student/faculty ratio (known as the student/staff ratio or SSR in the UK). FEMIS provides a standard method of measuring SSR and its associated parameters - ACS (average class size), ASH (average student hours) and ALH (average lecturer hours) In addition, FEMIS provides measures of unit costs and space utility factors. These performance indicators are described in more detail in ref 1.

Causes for Concern

The FEMIS software was piloted in a number of test sites and in general met its specifications, providing these institutions with timely and relevant information on their performance.

However, it rapidly became clear that many of the colleges taking the FEMIS software were not achieving satisfactory performance levels. Indeed, in some colleges the introduction of the information system was suspended because of the difficulty of extracting reliable data from academic departments. An account of the difficulties in one college is described in the FEMIS newsletter issue (ref 2).

A telephone survey was made of all users to find out to what extent they were using the software and whether they had installed the latest version. This was followed up by a questionnaire which was able to probe in more depth the success or otherwise of the implementation. Finally, detailed case studies were made of six institutions using a researcher to interview staff at all levels throughout the college (ref 3). A number of common factors were observed which has enabled the identification of successful implementation strategies which can now be passed on to new and existing users. The authors believe that these strategies are valuable whenever new systems are introduced into institutions, large and small.

It is our experience that many institutions seriously underestimate the planning and management necessary at the implementation stage - with the result that levels of expectation created by senior management are rarely achieved in the operational environment.

These factors in a majority of cases have little to do with the technical components of system hardware and software in the current technological environment, or in the ability of the client to define a coherent system specification. This is particularly so with the facilities provided by modern personal computers and the associated use of Decision Support Systems (DSS).

Ironically, the environment has turned round completely from the problems of the late 1960's and early 1970's where systems and applications software rarely met user needs.

Constant media attention placed on new technology and in particular the personal computer environment has generated an expectation of press-button systems and instant results. However, the swing from the provision of standard systems that fit most users rather badly to flexible systems which give the user more control has led to a new set of problems. The access by small scale users to low cost high performance systems is significant to UK Further and Higher Education - where a majority of colleges (some 600 in number) are able for around $8,000 to purchase a system capable of providing a comprehensive data base on institutional activities.

This accessibility has brought a new market of users into the environment, with a majority having limited technical and formal operations management and administrative experience, applied to technology driven systems.

Implementation - Factors in achieving effective performance levels

Many of the colleges, like a large number of small businesses, have very limited experience of computer based systems. They lack any major technical staff resources and typically operate with fairly informal managerial structures despite having complex relationships to other organisations. Strategic development of the college is typically part self determined but more so directed by a number of external agencies. Much of the information used to manage Local Education Authority (LEA) run colleges is in the hands of those external bodies.

Historically, the information requested of college managers by their LEA's met national statistical requirements and was by nature macro information of substantially more use to the LEA and national bodies than of operational significance to the college manager. Equally, information was gathered using different methods depending on the LEA or external agency requesting information. The opportunity for college directors to purchase at low cost systems geared to institutional management as much as LEA or national data

requirements created a significant opportunity to improve strategic, tactical and operational management. Equally, many LEA's have an opportunity to purchase systems for colleges and improve their own information base on their colleges.

The Prime Mover phase

Expectations at the system purchase stage vary greatly depending on the status of the prime mover (the instigator of the development) in the system. In many cases, the relationship of the prime mover to the other key managers is a significant factor in the success or failure of the venture.

Prime movers have been identified and fall into a number of categories:

Category 1 — The LEA management concerned to ensure effective management information from the colleges under its responsibility.

Category 2 — The College Director requiring more effective "what if" models to develop strategic planning.

Category 3 — The College Manager responsible for resource and financial management in the college.

Category 4 — The administration pressured by a lack of staff resources anxious to have control over student records, administration and tuition fees.

Category 5 — The computer centre (if one exists) concerned to sell its services and inflict technology on anything that moves or breathes,

OR

Category 6 — The enthusiastic amateur committed to microcomputer developments with a majority of experience in developing PASCAL for electronic engineering.

All directly influence the success or failure at implementation stage in terms of their views on system objectives.

Some Typical Scenarios

LEA Prime Mover

Concerned at the lack of auditable information generated by the college which requires them to act on an interventionist basis constantly trying to get a clear view of the college environment. Sometimes frustrated by the inability of the college to provide yet another set of information in a slightly different format to the last request. It is hoped that systems will provide better information, will not require too long a period to implement, and will then provide a complete database which can be plugged into a terminal in the central office. No real understanding of the manpower needs at implementation stage and the importance of establishing an operational database.

College Manager Reaction

College concerned that "status quo" management situation will have to change. System will place even greater burden on already pressured administration, and anyway, does the LEA really understand the problems of college management?

College Director as Prime Mover

Motive

Will probably be most concerned with planning models and every faculty head having a terminal on his desk. Totally underestimates the time scale for effective implementation of operational database. Will start to lose interest because operational database will take longer than expected to implement.

Solution

Should be given integrated package to develop "what if" models.

College Manager as Prime Mover

Mainly concerned in effecting better college management of resources and developing an effective operational database. Has sufficient status to move things forward and probably accepts the importance of securing an effective operational database.

College Administrator as Prime Mover

The Chief Administrative Officer is typically concerned with a rather narrow aspect of institutional development often centered around the statutary returns that have to be made to central institutions. This can often distort perception of information that is needed by the college managers and academics and can create problems in dealing with academic staff in terms of data collection and validation.

Computer Centre Manager as Prime Mover

Works on the basis that "if it moves, computerise it" motive.

College Enthusiast

Convinced that computerisation is a good idea capable of persuading College Director to go ahead, but with very limited overview of either LEA constraints or college constraints.

Harmonising these often conflicting objectives of the prime movers presents a critical task if successful implementation is to take place.

The system must recognise that each situation prior to implementation may be different but contains a prime mover. The system must identify the category of the prime mover and attempt to harmonise the prime mover objectives with other key movers who now represent all or some of the five categories.

The system must designate an implementation director (ID) who ideally should be a category 3 key mover. The ID's first and most important task is to harmonise the conflicting objectives of the key movers and prime mover. This has to be achieved in a number of face to face meetings where all key movers and the prime mover will be asked to agree to a set of system implementation objectives by the ID. The ID can then, following detailed written objectives, assume the role

of agreed prime mover. all our evidence suggests that this phase of analysis rarely takes place and is a major factor in systems not achieving their objectives.

Success in creating a systems agreement between the competing factions is a prerequisite to the next phase. Once this has been achieved, further factors have been identified that need operational implementation. These include:

- formation of an operational team of non-technical staff to set up data collection systems and define time scales for information collection headed by ID;
- personal interaction of ID with senior staff to explain the stages of development;
- visits by ID to all departments where the data collection demands are outlined at staff meetings;
- explanation by ID to staff involved of the need for data of this type to provide management information for external bodies as well as internal managers.

These procedures are described in more detail in a handbook designed to help colleges with the implementation (ref 4).

The cost/benefit generated by personal interaction of the implementation director has been high. Where traditional paper systems have been used to transmit either changes to existing systems or to outline new systems, benefits have been low. Small colleges, like small businesses, present

real problems to organisations advising at the implementation stage - they tend to have a large organisation mentality and find it difficult to take account of the personal level interactions that occur in small organisations.

At the operational level, such an approach can yield rapid benefits. The problems at managerial levels are being resolved by software tools that meet the real needs of decision makers.

Using Decision Support Systems for Management Decision Making

This section deals primarily with the procedures instituted at DIHE to ensure that the college managers make the most of the data so carefully collected.

It has taken around four years to fully integrate the FEMIS database within the institution's infrastructure. This appears to be a comparable time frame to experiences in other countries and is unlikely in our view to reduce despite technological advances.

Confidence at the operational level has been greatly increased during this period although it has by no means been a linear progression. Many highs and lows have been experienced as the institution has moved through the four year development cycle.

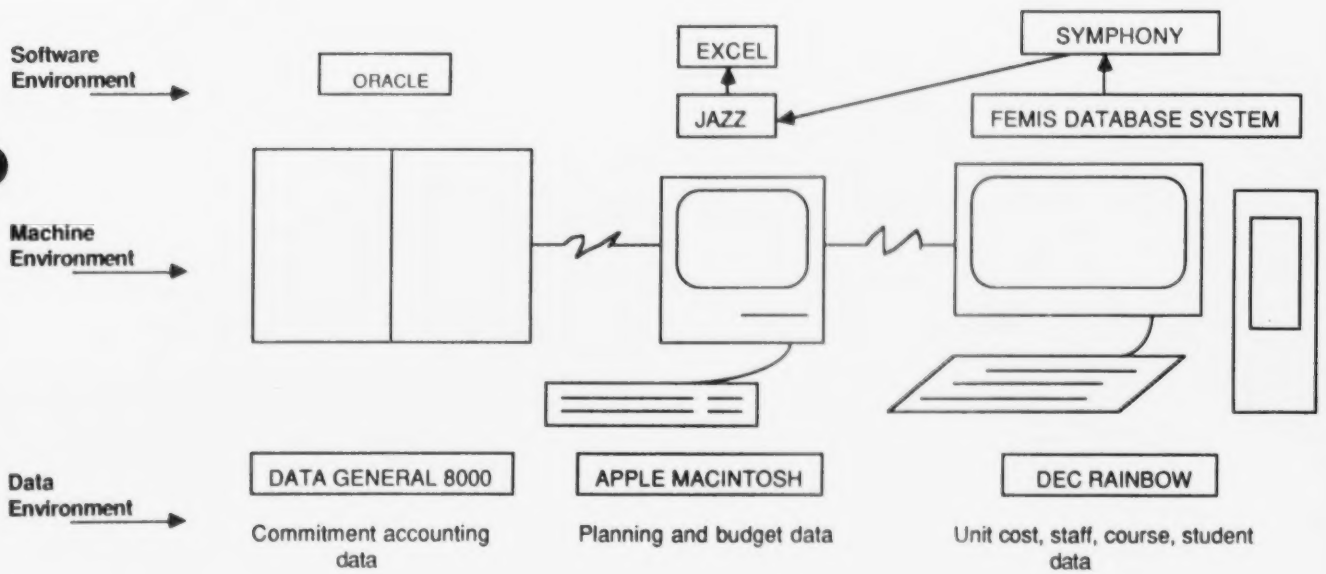
We are confident, however, that usage by senior managers at the "what if" level will increase dramatically with the introduction of integrated packages that are able to extract consolidated information from institutional databases. These integrated packages provide institution researchers and managers with a modelling system which is quick to learn and easily transportable. With the limited investment in institutional research staff in the UK, development will inevitably remain patchy.

The institution currently holds its main database FEMIS on a DEC Rainbow 100+ (10MB Disk 512K Memory MSDOS 2.05), with a range of integrated packages using this database and a newly developed commitment accounting system. A more detailed overview of systems is illustrated in Fig 1.

Fig 1

MIS DEVELOPMENT SYSTEMS

Dorset Institute of Higher Education



FEMIS has options to condense lecturer and course timetable analysis and course cost analysis to one line per lecturer and course. The condensed data can be written to a disk file. The structure of this file is such that the data can be picked up by most of the popular microcomputer packages. In the case of spreadsheet type software the data can go directly into the worksheet. With database management systems such as dBase II the data structure for the dbf file has to be identified before data can be imported.

As well as other packages running on the Rainbow, it has also been useful to transfer files (via LOTUS 1-2-3(TM)) to be picked up by JAZZ(TM) running on an Apple Macintosh. A variety of pre-structured decision models are available to Heads of Department as well as a consolidated set of data on staff courses and finance within the division.

A variety of models have been developed using top down philosophies. Whilst many of the decision support systems take actual data from the FEMIS database, some have been developed with a very limited base of information. Many are used as management aids in a highly uncertain environment, but nevertheless reflect a desire to develop models that may create a better view of the future than "back of the envelope" methods. It may be that integrated packages enable the "back of the envelope" approach to be extended with limited background data.

Many models produced using packages such as JAZZ(TM), SYMPHONY(TM) and EXCEL(TM) are predictive and mechanistic in solutions; others venture more clearly into DSS environments. All have been produced with very limited specialist staff resources, many rely on the accumulated experience of institutional managers' views of the world.

Typical of this process is the workload projection model that takes known performance parameters from the FEMIS database and translates faculty servicing arrangements (typically expressed and the distribution of Student Full Time Equivalents by department for a course). The UK system still works in the main on structures where courses reside within faculties or departments, with other faculties providing staff in part to the course.

In planning student numbers over a triennial planning cycle (each public sector advanced further education institution is allocated target student number in 19 programme areas with resources allocated dependent on the weight of the programme area), the individual faculty bids must be analysed in terms of the implied workloads on other faculty numbers. Interaction between faculties at the course level is high and the implied workloads enable the institution to formulate its bid. The national bidding system is relatively new to the UK and is in a formative stage of development. The workload projection models takes parameters developed from the current and previous course

files and determines the percentage of students distributed to other faculties. The faculty targets are fed in and produce an SFTE distribution by faculty. This enables a faculty head to look at a variety of forecast student numbers on his/her faculty staff projection and on other faculties.

The model is formed using the JAZZ(TM) database and spreadsheet package and the report generator.

The database is illustrated using a typical record layout and an output report included to give faculty a clear idea of other faculty commitments.

Course	Categ...	Mode	Dept	SSR	SFTE	PC Serv	85 6 SFTE
BABS 1	1	1	BMGT	17.21	24.6	45.6	32.4
BABS 1	1	1	F/L	12.63	18.2	33.7	23.9
BABS 1	1	1	IS	13.48	14.8	27.4	19.5
BABS 2	1	1	BMGT	15.85	30.6	58.7	29.3
BABS 2	1	1	F/L	11.4	14.8	28.3	14.2
BABS 2	1	1	IS	8.36	6.78	13	6.5
BABS 3	1	1	BMGT	17.75	1.47	3.1	1.3
BABS 3	1	1	F/L	9.84	2.02	4.2	1.8
BABS 3	1	1	IS	363.8	38.8	81.3	34.9

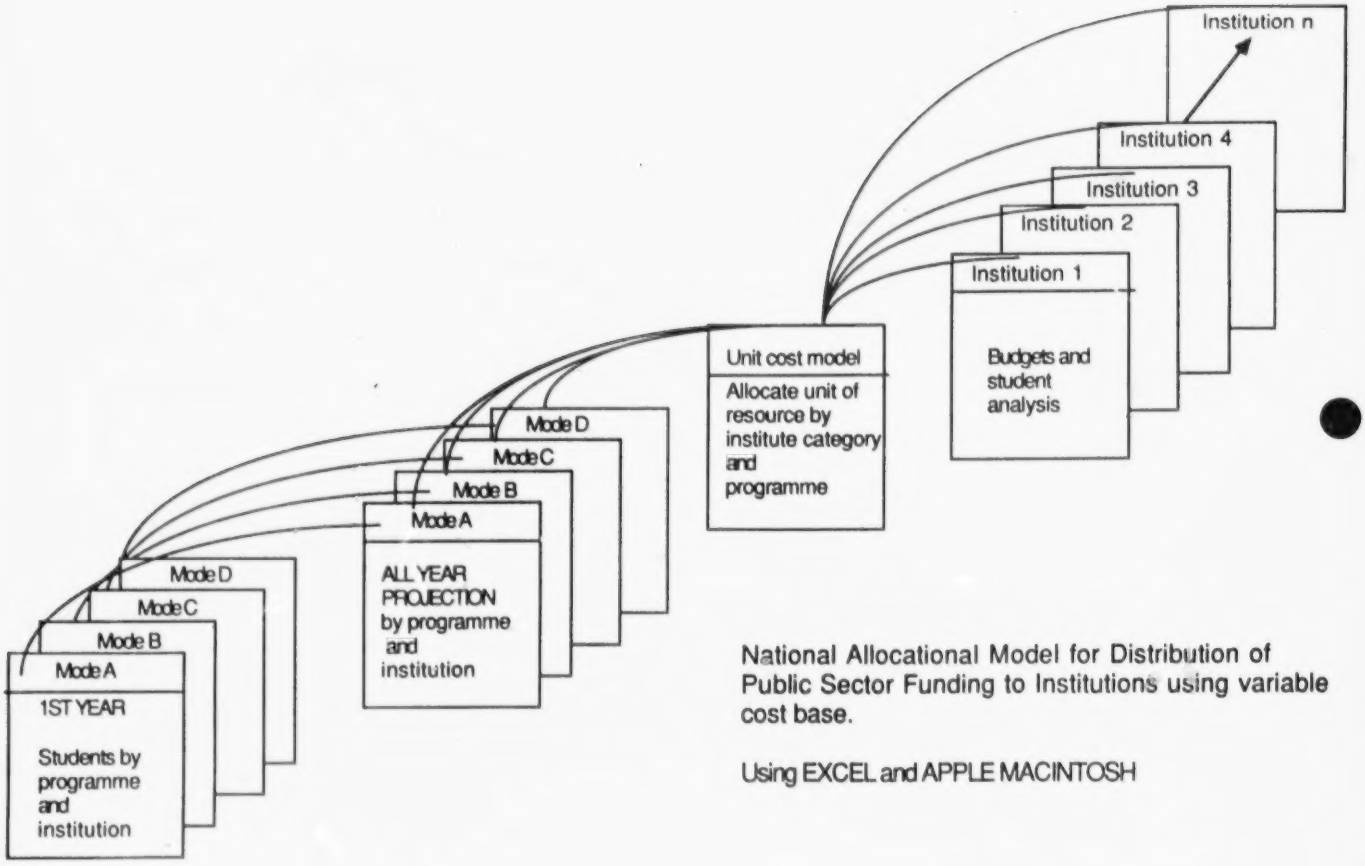
Using these Faculty SFTE calculations and the staff/student ratio, a projected academic manpower plan can be developed over the cycle.

Some development work has also taken place to investigate different models to distribute the public sector funding of higher education in the UK. Fig 2 outlines the approach

using linked spreadsheets using the EXCEL(TM) package on an Apple Macintosh.

The advent of these flexible decision tools for managers has greatly increased the readiness of academic managers to explore policy issues tied to resourcing constraints and to examine operation data.

Fig 2



National Allocational Model for Distribution of Public Sector Funding to Institutions using variable cost base.

Using EXCEL and APPLE MACINTOSH

The Future

The experience we have had with FEMIS has shown how arduous the transition can be from traditional management techniques and styles to the realisation of the benefits that can result from the use of decision support tools on modern personal computers. Perhaps we expect too much from the hard-pressed college manager. This paper celebrates in part the legerdemain techniques that skilled computerists can operate - the transfer of data out of one package and into another, and out of one machine and into another.

It is perhaps too easy to be dazzled by techniques. Managers want the easy-to-use performance of the packages that have come along with the personal computer revolution. However, few have the time or energy to wrestle with the problems of incompatibility between packages and machines.

At present we marvel at the ability of one package to pick up data from another package which may have run on another machine. Most "Decision Support Systems" depend upon this kind of operation. It is clear that this is unsatisfactory. The future must bring more integration both in terms of what packages can do and what machines they run on. If it can be made easier, we will see a new breed of managers, able to take advantage of the data so laboriously gathered. Future developments of FEMIS will make use of "fourth generation"

software where the benefits of large scale integration are becoming realised.

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